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ABSTRACT

This paper provides basic information on searching the Internet and describes sites of interest in the area of rural special education. The first section traces the evolution of the Internet through various phases--ARPANET, NSFNET, CERNET, and the beginnings of the World Wide Web--and describes various protocols (methods and tools) developed to provide access to the directories of local servers. The second section describes the Internet today; presents a sample search engine and simple and advanced searches; explains general search strategies, how to make a search effective, and what to do about unexpected or inappropriate results; and lists and describes various search engines and their methods of searching the Internet. The third section lists and describes many sites of interest, including rural sites; sites for kids; free software and shareware for disabled children; sites for parents of disabled children; multipurpose sites that link to more specific sites; content specific sites providing resources in literature and language arts, mathematics, science, and social studies; software for teachers; sites for special education teachers; general disabilities sites; and sites that provide information and resources related to mental retardation, learning disabilities, attention deficit hyperactivity disorder, and the visually impaired. The final two sections describe HTML (hypertext markup language), how to write HTML documents, and how to create Websites and homepages. A table presents features of six World Wide Web search engines. (SV)

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ED 407 201

USING THE INTERNET IN RURAL SPECIAL EDUCATION: ACCESSING RESOURCES

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History

ARPANET- In the beginning there was the Advanced Research Projects Agency Network (ARPANET) which was created to tie the Department of Defense (DOD) and defense contractors together. This network, based on dynamic rerouting, was designed to reroute messages in case pieces of the network were lost. That is, if the bombs fell and destroyed parts of the network, the remaining parts could continue to maintain communication. The bombs never fell, but a similar system was tested by the Iraqi's in Desert Storm and the Iraqi command and control was very difficult to destroy.

Universities wanted to be part of ARPANET as many were defense contractors or subcontractors and so the universities climbed on board in the1970s. Soon there was enough traffic that the system was divided into two systems, one for the military (MILNET) and the other for nonmilitary sites (ARPANET). The two networks could send messages to each other using code called the internet protocol (hence the term "internet") which was designed to allow many networks to be interconnected. Thus dawned a whole new communication universe.

At the beginning of the 198's, computing at universities was moving away from mainframes and towards the desktop. Starting with workstations and moving toward personal computers (PCs), users needed to be able to share file, directories, and email. UNIX networks were developed and hooked to ARPANET. The system began to overload.

NSFNET - At the same time the National Science Foundation (NSF) began to fund networks for super computers designed to allow university researchers to have access to the new super machines even if they were not in close physical proximity to them. ARPANET was not used for these connections. NSF set up regional networks and strung them together using the same technology as ARPANET in a system called NSFNET (National Science Foundation Network). This system, designed with higher capacity, was used by universities and many of the ARPANET servers and associated traffic migrated to the new, faster network.

CERNET - In Switzerland at the CERN laboratories (European Laboratory for Particle Physics), a CERNET network was developed in 1981 using the STELLA satellite to connect two local area networks (LANs). The CERNET was modeled on ARAPNET (http:www.internetvalley.com/intval.html). By 1990, T. Berners-Lee began creating the world wide web (www) using the NeXT computer's object-oriented technology. Hypertext was used to link web nodes which could be browsed at will by remote users. To facilitate linking many servers, Berners-Lee developed the uniform resource locator (URL), hypertext transfer protcol (http), and hypertext machine language (html) using UNIX based servers and browsers. The NSFNET system in the U.S. became the backbone of what we now know as the internet. At this time, commercial providers maintain the backbone and users other than universities and researchers are subscribing to the various internet providers in droves. Some estimates place users in the 100,000,000 range in early 1997. Now, the internet is a global network of LANs and hosts developed on the basis of computer science concepts. LANs can be connected by a variety of means, i.e. www, gopher, FTP, email, and others.

The Beginning of the World Wide Web - The web began at CERN in Switzerland in 1989. It is a hypertext (allows movement from link to link) multimedia (combines a variety of data into one document [text, images, multisize fonts, audio, video]) distribution information system. In a distributed information system the documents are distributed throughout the system instead of being centrally located. The graphical interface leads to the development of graphical browsers (computer programs which can assist in the retreval of files of all natures not just those in ASCII) such as Mosaic and Netscape.

As information sites multiplied, the new systems made it easier for information to be transferred. The architecture was open in the sense that everything could move in ASCII using the hypertext mark up language (html). But, it was hard to move information that did not easily translate into ASCII, such as graphics. And then came the graphical user interface (GUI) which led to the development of the world wide web (www).

Internet Tools - A variety of protocals (methods and tools) were developed to allow different users to gain access to the directories of the local servers. These included WAIS (Wide Area Information Server), ARCHIE

(chosen because it sounded like the word archive, http://www.belnet.be/services/archie-info.html), VERONICA (Very Easy Rodent-Oriented Net-wide Index of Computerized Archives), and Gopher (a server used to link to other servers at a remote location and read the remote server's directory--named for Minnesota's golden gophers by its developers at the University of Minnesota). From these protocols we derive almost all of the technology which you, the user, will see as you conduct searches on the web. (The web is the set of linkages between the servers around the world which are interconnected by the internet protocol and are searchable and indexable using search engines. More on this later). WAIS allows you to search messages for date, subject, sender, from (originator), cc (carbon copy to) and "to" fields. This forms the basis of Usenet for temporary usage in the modern internet. Usenet is is the label given to the temporary message traffic like email that flits across the net and is not meant to be permanent. In searching, all of the typical boolean expressions (AND, OR, NOT, plus adjacent or ADJ) can be used as well as parentheses and right truncation wildcards. Directions on how to search this server are provided at http://town.hall.org/utl/wais_help.html.

ARCHIE - This server (or set of servers as there are a variety of ARCHIE locations) which is designed to provide access to file archives located at many servers in various locations. ARCHIE searches by subject in a rudimentary way. The system can be either form based (Archieplex ,e.g., http://www.inet.net/~harrell/archie.html) or nonform based (Archieplex gateway, e.g., http://www.tu-ilmenau.de/ar-gate.html). ARCHIE uses a search engine or indexing spider to read directory and file names and indexes them in one large directory. Queries are then made to the index which has been created. ARCHIE uses all of the boolean operators that other systems use.

VERONICA - Designed to search gophers (servers which allow you to go for information), VERONICA is an indexing and retrieval system which searches headings in gophers and their titles to develop an index. The developed index can be searched using boolean operators, parentheses and right truncated wildcards. The first gopher, at the University of Minnesota, known as the big mother gopher, maintains the listing of all other gophers. Any gopher server listed with the big mother gopher can be accessed through VERONICA.

Searching the Internet

Internet Today - Today the internet comprises many users (subscribers) who have information which can be posted and accessed on the net. Well, that is not the half of it. The internet provides information but no organizational structure. There are as yet no standards or standard formats, no organization by subject (as one might find in a catalogue), and no single index which lists all that is available (Winship, 1995, @ http:www.bubl.bath.ac.uk/BUBL/IWinship.html). The www provides users on LANs and their connection the opportunity to develop a "global field of the texts" (http://www.internetcall.com/intval.html) in which all parts of the text can be cross connected with all the other parts. The www hyperlink approach allows connection of not only text but images and many subsets of the new field of text using hyperlink technology.

Central telephone trunk lines are the internet backbone which tie the regional LANs together. Telephone companies rent space to internet providers such as Prodigy, Compuserve, or America On Line. Within this system there are a variety of servers which contain links to information. The servers are electrical devices which hold information and links to information electronically. For example, a university might have a server which was dedicated to reaching out from its internal network to the telnet (a protocol for reaching from your local workstation to another workstation at a distance). The server would be organized so that many local users could maintain information in its' directory and transfer that information to other servers in other locations using the telnet protocol.

The internet is evolving at tremendous rate. Most of the tools and resources which we will look at did not exist in 1994. In fact, as this is written in 1997, we look at text written in 1995 as obsolete unless it deals with definitions and very basic topics.

Uses of the Internet - This section deals with accessing resources related to regular and special education via the internet. This information will help you in your teaching and in your own personal development. We assume that you have, or will soon have, access to the internet in your school, home, library or classroom (this seems to be the rapidly developing trend). If you do not, the information in these articles can be used as a lever to help you obtain a computer, modem, and an internet link for your school, classroom or home.

Why would you want to learn about the internet? What could you gain? Well, think about it this way; the net is, if you like candy, a huge candy store. It is the biggest candy store in the world and growing at a hypergeometric rate (internetvalley@http://www.internetvalley.com/intval.html). It has, perhaps, as many locations (called sites) as the largest library in the world (over 100,000,000 and increasing by the minute). To give you an idea of the growth rate consider this-- in 1993, before search engines, a single person could find most of the good places to find information by browsing (following links from one page to another). Now that cannot be done! Now there are 100,000,000 estimated users and the pool is still growing. No one person could keep up with the growth let alone with the pool.

Some examples of the types of information and free software and you can get are listed below: for you and for your students (http://www.shareware.com/), for parents with particular concerns, e.g. the ADHD owner's manual (http://ourworld.compuserve.com/homepages/edutech/), children's books which you or your students can read on line (http://www.ucalgary.ca/~dkbrown/index/html), reference books and materials (http://www.itools.com/research-it/research-it.html), cyberplaces where you can pose questions to other teachers and get answers, e.g. teachers helping teachers (http://www.pacificnet.net/~mandel/), cyberplaces where your students can get kidstuff (http://yahooligans.com/), and where students can talk to each other (http://www.yahoo.com .societyculture.children/links_for_kids), places that have free games that can be used for all kinds of drills, eye-hand coordination, and the like (http://happypuppy.com/games/lordsoth), free ERIC searches (http://www.classroom. net/), and the list goes on. These examples show you a tiny portion of the wonderful free resources available on the internet.

Information on the internet is located in discrete locations (sites). These sites are accessed when users enter information that is unique for that site known as an address or a uniform resource locator (URL). If one does not know the specific address, the site may be found by searching. To search the net you can look at specific directories, e.g. Yahoo (http://www.yahoo.com) or you can use a search engine e.g. Alta Vista (http://altavista .digital.com/). A directory is a listing of sites which have been sorted or catalogued by a real person. A search engine is a computer program which follows links and records all or some of the information about the site found at the end of each link. An index is a collection of linked sites composed by a search engine.

Hardware and Software Needs - Hardware needed includes a telephone hookup, modem, internet provider (server), and at least a 486 computer. Software needs include a browser like Netscape which can be downloaded free from the URL http://angel.heaven.net/netscape.html. A browser is software that searches links in an index created by a search engine. With your Netscape browser installed you should have a Netscape page which gives you buttons for NET SEARCH (random entry to several search engines), NET DIRECTORY (a list of search engines, indexes and specialized search guides), and a command location (called OPEN in Netscape) which is used when you know the address for the site you wish to visit.

Example Search Engine - There are many search engines which operate in different ways. Alta Vista (http://altavista.digital.com) is a full text searcher which accesses both the web and Usenet (which houses chat rooms, user groups, bulletin boards, and other short term data displays). This engine can scan all the text or specific segments of the indexed document. For example, the engine may scan the host (the server where the site resides), site titles (title scans reduce the number of results), images (pictures or videos), links (document connections), URLs, applets (miniprograms written in Java script), or anchors (which point to hypertext links). Each of these locations in the document can be used in searching the index created by the Alta Vista engine.

Before You Search - Once you have called a search engine, you have to remember that computers are stupid, you have to tell them exactly what you want them to do. This tends to make initial searches somewhat less than perfect. You have the option of choosing among many search engines when you begin to search. Each engine collects its' index in a different way and this leads to a less than complete matching between engines. To have a comprehensive search, you need to use more than one search engine. Whatever engine you begin with you must familiarize yourself with its' options. These options will determine which mass of indexed data will be searched. For example, you might search the world wide web, Usenet (for user groups), gopherspace (servers which were used to store data before there was a web), anonymous ftp (file transfer protocol) sites, and so forth. Usually there is a button on the page which allows you to choose where you will search. You may also be able to choose the level at which you will conduct your search (simple or advanced). Sometime there is a button for this, but many pages

give a less obvious entry point. If it is unclear where the button is just explore the page clicking on all of its features using your mouse until you find out what each one does. You should probably do this anyway just to insure that the page has not had new features added to it recently. The field is moving rapidly and new innovations which will improve your searching ability are being added to search engines all the time.

Option settings for a search can be personalized by each individual or set to default by the search engine when no other directions are given. Some options are where to search, (e.g., the web), what to search for (e.g. all the words), where to search (e.g. in the title), and so forth. Each engine has different default settings with which one should become familiar to get the results you want. Changing default options defines and delimits your search.

Searching with Alta Vista - Alta Vista accepts two levels of query: simple and advanced. A simple query uses one word, several words separated by boolean logic terms (AND, OR, NOT etc.), or a phrase (a string of adjacent words) used to answer the question "I want to find out about (*put your word or phrase here).*" If a phrase is used, it needs to be put in double quotes to tell the computer that it is a related string of words not a string of words separated with ORs (the default in this engine). If double quotes are not included, the engine may find thousands of sites which include only one of the words. Alta Vista is case sensitive. Capitalization of proper nouns is necessary and forces an exact match. An exact match is forced by putting a plus (+) sign before each word that must be in the document or a minus (-) sign before a word to exclude documents with undesirable words. Both + and - are used without spaces so the computer knows they are attached to the specific words. For example, in a search for documents related to the concept *empathy* as a construct used by psychologists, most of the sites found related to a musical group called Empathy. To exclude the musical references we used the search empathy -music.

Another feature of the simple search is truncation. Some search engines allow you to look for plurals as well as singular words by automatically using only the root of the word you search. With Alta Vista, you have the control and can decide when to truncate. To truncate a word, give the first three (or more) letters then star (*). For example, if we truncate empathy with empath* we would get empathy, empathic, empathetic, and empathicide, and so forth on the same search. If we do not truncate, these variants will not be included in the results of the search and some valuable sites may be missed. Another ideosyncracy of this engine is that punctuation is treated as white space and white space defines words, i.e. if you search for "John's Fishing Dock" you are searching a four word phrase. This can cause some real conceptual problems and can make you wonder about your results.

The final thing you must do before you search is to determine what you want to search and what parts of the text you want examined. A *titles only* search limits the results to only documents/sites that are strongly related to your search terms with the search terms in the titles. You may miss something, but all the results should be of interest. If you use *full text* you will get a lot more results but as we found with empathy, it may be a single mention of the term in paragraph twenty-eight of the document. If you have selected your terms you can submit your search by hitting the enter key or clicking on the submit button with your mouse.

The advanced search gives you more ways of structuring multiple word queries. Advanced searches examine the same fields with a simple search, but add parentheses and the boolean logic term NEAR as well as AND, OR, and NOT. For example, in the empathy search we may be interested when it is related to psychology in which case we search empath* NEAR psych* with both words truncated. In Alta Vista, the NEAR operator will find words that are within 80 characters of each other. If we are interested in both terms together in a site but we do not care if they are in close proximity, we would search empath* AND psych* with both words truncated. If we are interested in either empathy or psychology but not specifically both, we could search empath* OR psych*. This later search would give us many more hits using either a text or a title search. If we want to exclude the music group Empathy, we might search psych* AND empath* NOT music. Parentheses are useful for delimiting phrases. Operations within the parentheses, as in algebra, take place first and in the order presented.

In the advanced search the results are returned unordered unless the search terms are entered in the ranking field in the desired order. This is not a great problem if you get eight results but if you get four hundred, sorting can be a major problem. For example, in the empathy search we searched empath* AND psych* NOT music in titles and put empathy in the ranking field then all titles with empathy in them were listed first.

General Search Strategies - Formulating a successful comprehensive search usually begins with the

question "What is out on the net about_____?". The question must be clear, concise, and contain key words to exactly describe your area of interest. After you determine the research topic, consider the scope of the topic in question. This usually involves a narrowing process from broad topics and questions. For example, for the question "What is out on the net about special education?" we will find somewhere between thousands and millions of results, depending on the search engine used. If we narrow the question to what is available about ADHD we still are biting off more than we want to chew. We might narrow the question further to ask "What resources are available to parents of ADHD children which they can use to understand why the children behave the way they do?" This would bring us the ADHD Owner's Manual (http://www.ourworld.compuserv.com/homepages/edutech/) and a number of other sources. Determining the concepts in the question for selecting the search terminology is the next step in developing a search strategy. It is usually appropriate to start with a conceptual analysis prior to the development of your search terms. The concepts used will not necessarily be the terms used in the search. For example, in the ADHD search will your search engine recognize the acronym or do you have to use the full name (attention deficit disorder hyperactivity or ADHD)? When you pick search terms be sure to include synonyms if there are any because other people may not use the exact same terms you use.

After you have selected the terms, select the search logic. The search logic relates to how you ask the search engine to look at the search terms. In our ADHD example we want to look for ADHD in children and for resources for parents. Therefore, we need to tie the ADHD to the children and then tie the whole thing to parents. We also must decide which synonyms for children and parents we want to use. Assuming that we want to focus on children who are preteens we might start with a search string something like this: "attention deficit hyperactivity disorder" OR "attention deficit disorder" AND hyperactivity AND children OR youth AND NOT teenagers AND "parent resources". After you develop the search string, you can select the search engine.

Effective Searches - For an effective search, consider the following concepts: if you are doing a general search, did you search titles only to keep from finding your search term embedded in paragraph twenty of the document? If you are searching for a series of names, you need commas between them. Too many results? Use uncommon terms or unusual words, alternative words with the same meaning, or synonyms to reduce the number of results to a manageable level. Some search engines ignore any 1-2 letter words which may change the meaning and direction of the search. Did you use truncation properly or did the engine automatically truncate and give you things you did not want? Does your engine give you partial searches and if you got a partial search (one or more of the search terms were not used) did the returns look like anything that you could use? Use properly nested parentheses or hyphens between words or terms to get the result that you want. For example, you get different results from (special education) AND blind and from special AND (education blind) and special AND education AND blind. Did you exclude the things that you did not want by using AND NOT, NOT or (-) minus? If you used minus remember there should be no space between it and the term. Did you misspell a word or forget to include a variant that you should have used? Capitalization of proper nouns is important as some search engines are case sensitive. You will find much interesting information, but don't be distracted by random topics even if they look good. Put in bookmarks to come back to those sites and go on with the search.

Unexpected or Inappropriate Results - You may get unexpected search results. Sometimes you will conduct a search and when you look at the results you will say to yourself "What happened here?" If nothing on the result list looks anything like what I wanted, you may want to think about the following ideas: Did you get a full or a partial match? If all query terms were not used, use + or - to refine the search. Did your engine use autotruncation to give you all forms of the search terms resulting in useless information? If you used more than one term, did the engine auto default to OR? Sometimes a page creator puts words in the tag, title, or address that are not in the body to draw engines to the page.

You may get a result that looks interesting, but when you call it, it may not respond. There are several possible reasons for this to occur. Occasionally, pages are removed by the owner. Sometimes a page is renamed by the owner so that changes in its content will be more adequately represented. Usually the owner will leave a directory link that you can click on to get to the page in its new location. However, when this is not done you must wait until the page is reindexed by the web robot, which may take several days or weeks if the server on the other end of the connection is down or too busy. When it comes back up you can access the link if you have bookmarked it. Sometimes the server on the other end is busy and your server times out or fails to connect within its required time and breaks off the connect attempt. When this happens you may want to wait a few minutes and try again, or

try at a less busy time of day (for the time zone the server is in), or try a mirror site. If the server is geographically far away it may take longer to route to it, be patient. Finally, check the server's hours of operation, it may be shut down for the night (check its time zone). The server on the other end may have access restrictions which will not allow unauthorized users to connect. Usually, but not always, the server will prompt you to input the appropriate password, depending on the system you are trying to reach.

Sometimes you will see "Error 404 page/file not found" when you are following a link. When this happens check to make sure you have put in the correct URL. If the engine is case sensitive check for case. Also check symbols, e.g., ~, to make sure they are correct. If the URL is long, move up the tree to a higher level in the directory until you are at the top of the tree. If you still get a 404 error it is likely that the URL does not exist or that the link was set up incorrectly. Finally, your system may be designed not to allow you to connect to certain sites or kinds of sites, like the V chip for children's television.

There are times when you know a link is out there, because someone told you about it or you heard of it but did not get the address, and you can't find it. This may happen due to heavy traffic, the server being down, or the search timing out as previously discussed. Also, robots (search engines) may have been excluded from the site using the robot exclusion protocol. When this occurs, the page you are looking for is behind a firewall or gateway. A firewall is a program which is designed to exclude outsiders from accessing protected information which is confidential, sensitive, or secret. In some cases, a page may have multiple URLs associated with it and your engine has not reached the one that you want. This is likely to happen if the engine uses a breadth search and what you want is below the first page level. Another reason is that a site, particularly a new one, may not have common links with other sites. Remember that web robots follow links and if there are none the site can sit there forever without contact from anyone who does not address the URL directly. That is why those who put up pages try to get others to link to them and look at them.

If you are looking for a news group there are a few other reasons you cannot find the desired pages. Usenet only works with a browser that supports Usenet news. If your search engine does not support Usenet news, you won't find them. You need to insure that your browser specifies the server you want in its preference settings (NNTP). Some news servers are provided by particular internet providers and not all of them give access to all engines, a few require a fee to be paid to the provider and if this arrangement has not been made your access will be restricted.

Selecting a Search Engine - After you develop the search string, you can select the search engine. Obviously you will have one or more engines in mind as you create the search logic but, you should not let the engine dictate what logic you use. This is another reason that you should be experienced with several search engines.

So how do you decide what terms to include? The first and best answer is to really know you topic area, but that will not always be possible. A dictionary, thesaurus, or an encyclopedia are good places to start. These references can help you and your students find more about what they need to conduct a search. If don't have them in your room, you can find them on the net. There are many locations for each but you can start with a dictionary (http://www.itals.com/research-it/research-it.html), a thesaurus (http://www.beacoup.com/engines.html) and an encyclopedia (http://www.bigeye.com).

Also, think about how your search engine orders the results of your search. With some engines you can influence the order in which the results are returned. For other engines, the order in which you submit the search terms determines the way the result set is presented. You should try several practice searches with two or more terms on each engine you plan to use frequently and see the result of changes in term order on the result set. The changes in some cases are quite dramatic.

When you use a search engine for a search, the search protocol is directed by key words or phrases to examine the index created by the search engine searching for information containing those key words or phrases. When a search engine goes out to look at the net again it starts with the sites previously searched and looks for new links. Thus, the most popular sites are visited first and the search process is biased toward those that are popular. Therefore, a pertinent site may be out there but it will never be found by a search engine that follows links, if it is never pointed to (linked) by another site or if it does not point to other sites (have links).

It may help understanding to say here that no search engine ever takes your search request and goes to the web to look for what you want. The search engine only looks at what has been placed in its index. Therefore the larger the database searched the more likely you are to find what you want. Directories like Yahoo are usually much smaller than indexes but, and this is a critical but, they have been put together by real people. This means, hopefully, that the contents are more relevant to a particular topic than sites randomly harvested by robot searchers.

Breadth and Depth Strategies - Some search engines use depth strategies for searching and others follow a breadth approach. In a depth strategy the engine looks at the highest link in a site or directory and then it burrows in and looks sequentially at all of the links to the pages which are below it. Thus, a page with a lot of internal links will indicate a lot of very similar uniform resource locators (URLs). A URL has several components: 1. the name of the protocol which is used to locate it (http or hyper-text transfer protocol for the internet); 2. the internet address where the document resides (www -world wide web); 3. the directory label of the server; 4. and the file name of the document. The file name is usually followed by an extension which indicates how the file is marked up or the language in which it should be read, e.g. html. Thus a single document might have many very similarity labeled components. Each of the components will be in an index when a search engine has used a depth search strategy.

Breadth searches are much simpler. When a breadth search engine looks for documents it looks only at and indexes the top page of the link. Pages or links that are below the first page are not recorded and the information is not included in the index. The only way that this lower level information will be in the index is if the page is linked on the top page of another document. This system leads to some omissions where desired information is in, say, an appendix, but the search engine never reaches and records it. This is another rationale for using more than one search engine and for picking that engine to complement the primary engine you use in a comprehensive search.

A Table of Search Engines - To help you select a search engine, a table has been created at the end of this paper. The table presents information concerning several engines which are popular at the beginning of 1997 (note the date because technology moves fast and this list may soon be out of date). The table "Web Search Engines" was created from data provided by Page, 1996 (http://www.zdnet.com/pccomp/ features/fea1096/sub2.html) , Stark, 1996 (http://www.stark.k12.oh.us/docs/search/) and Westra, 1996 (http:www.curtin.edu.au/curtin/library/ staffpages/gwpersonal/senginestudy/compare.htm). All of these engines have been recommended by multiple evaluators, see Perfect, 1996 (http://webreference.com/content/search/ features.html), Westra, 1996 (http://www.curtin.edu.au/curtin/library/staffpages/gwpersonal/senginestudy /compare.htm), Barlow, 1996 (http://www.monash.com/spidap.html), Overton, 1996 (http://www.pcworld.com /workstyles/online/articles/sept96/1409_engine.html), Arents, 1996 (http://www.mtm.kuleuven.ac.be/services /search01.html), Notess, 1996 (http://www,imt.net/~notess/search/multip.html), and no author (http://www.zdnet.com/).

Multithread Engines - Most search engines search only one index. However there are a number of multithread search engines available such as Savvy Search (http://guardldr.cs.colostate.edu:2000/), Metacrawler (http://metacrawler.cs. washington.edu:8080/) and the like. These multithread engines allow you to use other search engines either sequentially or simultaneously to search the indices they have created. Generally these are not recommended. The rationale for not recommending these multithread engines relates to their use of boolean operators and similar constraint term. Many times you cannot be sure that the commands will pass through to the various engines or that the engines, in fact, accept these terms. This means that you will get back many results which may not relate to that for which you are searching. It is good practice to be familiar with several engines that differ in searching techniques. Start with the end in mind. Different engines order the results in different ways.

Sites of Interest

Rural Sites - There are a number of sites which provide links to rural interest locations. We might start with the Northwest Regional Education Laboratory's Rural Education page. From this page (http://www.nwrel.org /ruraled/) you can link to ERIC-CRESS (http://www.ael.org/ericp.htm). You could also contact the National Rural Education Association which is the oldest voice in rural education (http://www .cocostate.edu/orgs/NERA) or you might be interested in looking at research and development resources for rural schools (http://www.ael.org/polling).

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This site is the lab that houses the Clearinghouse for Rural Education and Small Schools. You can look for rural community development resources (grants and other funding) at http:www.unl.edu/Kellogg/Index.html, and for rural development partnerships (http:www.rurdev.usda.gov/nrdp). Finally, on the laboratory homepage you will find the Rural Education Directory which deals with the nature of rural education. It is also found at gopher://ericir.sry.edu:70/00/clearinghouses/16houses/CRESS/directories rural.asc. This gopher contains many resources which may interest you, such as articles related to the following topics: declining enrollment in rural areas; recent articles from the Rural Special Education Quarterly; articles on fiscal equity between large and small schools; issues related to being at risk in rural areas; resources for teaching math and science in rural schools; lists of rural resources and organizations (including ACRES); rural early childhood issues; suggestions for alternative assessment in rural schools; issues related to the use of a four day school week in rural settings; guidance and counseling approaches which are best for rural areas; recent Journal of Research in Rural Education; student grouping practices; population trends; and articles from the Rural Educator.

Another rural site location called Rural Information Center Publications (http://www.nal.USDA.gov/ric/) has links to a variety of rural education resources, lists of federal funding opportunities for rural development and rural education, and rural studies for scholars and educators. If you are interested in groups or associations which are rural focused visit either http://www.c3lanl.gov/~jspeck.USA.shtml or http://diogenes.sedl.org. The latter lists national and state providers as well as access addresses for the following journals: Rural Sociology, The Rural Sociologist, The Rural Educator, Rural Development Perspectives, Journal of Rural Community Psychology, Journal of Research in Rural Education, The Country Teacher, Appalachian Journal, and Appalachia.

Pitsco's rural page (http://www.askanexpert.com/pitsco/rural.html) has a number of interesting rural links which you may be interested in exploring. Here you will find access to information about rural town planning, rural school grants, rural education and the schools, methods for broadening student horizons in rural schools, curricula for farm and rural safety, education in rural America, and conditions of education in rural schools.

There is a page for rural superintendents (http://www. AASA.org/rural.html). This page has reports on rural issues focused toward rural superintendents, rural resources, access to the Rural Superintendents' Journal, The Back Fence, articles about rural consolidation and student learning, and the role of the rural school in community development.

There are sites specific to the acquisition of federal funding for rural projects (http://www.learner.org /content/ed/fund/edfund.html) and sites for rural policy studies (http:www.rupri.org/rupolicy/index.html). This latter site lists the US House and Senate rural issues, which are under discussion during the current session or which are carryovers from the last session. There is also a large list of links called Rural Internet Resources (http://www .rurdev.usda.gov/nrdp/rural.html).

There is a Foundation for Rural Service (http://www.frs.org/) which provides information on rural telephony, listings of rural telephone cooperatives in America, the results of a survey on the use and access to the internet by rural residents, and links to other rural sites. There is also a centralized site for email discussion (http://cl.k12md.us/RES/email.html) groups which will put you in touch with people interested in the following: rural women; physical medicine and rural rehabilitation; rural health; rural tourism; rural public administration; migrant education; rural and community development; rural trends and conditions; rural sociology; rural networks; the rural special interest group of the American Educational Research Association and others.

Sites for Kids - There are quite a number of sites for children which your students will want to explore when you have the internet in your classroom or library. We will list only a few of these because kids, once they get started, are likely to find many more that they are interested in without our help. A large site which is created specifically for children is Yahooligans (http://www.yahooligans.com/). This site contains the best of the Yahoo directory of items which are appropriate for children and youth. The site will also link to the adult Yahoo (http://www.yahoo.com/societyculture.children/links_for_kids) and provide links for kids. This page provides links to the Whitehouse for Kids, Wombat Net, Girl Talk, The Playroom, The Camel Who Disliked Smoking (an antismoking site) and more. Other general sites which you may want to send children to is Kids Link (http:www.microsoft.com/616/default.htm) and A2Z, Just for Kids (http://www.a2z.lycos.com/Just_For_Kids).

There are many sites oriented toward children which provide information and instruction on how to do something. These include libraries e.g., http//www.bcpl.lib.md.us/~hhirsch.learn.html, which focus on learning up to age 10; the Online Internet Project (http:arlo.wilsonhs.pps.k12.or.us/search.html) which teaches students how to search the net by going through the process of choosing a topic, developing a search strategy, teaching where to search and how to evaluate the results); the Ebsco site which lists 400 accessible magazines and provides Kidsnet (http://www.ponyshow.com/kidsnet/website.htm); Research-it (http:www.iTools.com/research-it/research-it.html) which allows students to look up quotations, acronyms, use a dictionary electronically and provides translation to and from a variety of languages; childrens' literature can be found at Stories for Kids (http://www.thekids.com) and Science for Kids (http://www.now2000.com/bigkidnetwork/science.html), which provides access to zoos, museums, sports, and other science related topics.

There are a few generic sites which have applications which kids will want to use such a The Big Eye (http://www.bigeye.com/) which provides access to the CIA fact book, Usenet, and over a thousand other interesting sites. Electronic texts are available (http://www.pacific.net/) which provide an online book page, and access to Alcuin, Alex, and the Columbia university library. There are many shareware/freeware sites for both DOS and MAC based applications, e.g., http://www.shareware.com/, and http://www.jumbo.com/.

Software/Shareware/Freeware for Children -There are numerous sources of free or inexpensive software for children. You are advised that all software should be looked at by parents or a teacher before it is used with children. Most of the time the creator will describe the level for which the program was designed, and sometimes they are right on target. Students should not be asked to use software that is too difficult for them or too easy.

There are many pieces of freeware which have been developed to help children with a variety of disabilities function more effectively. Sites that provide this kind of software include Kaitlin's Place (http://www .rit.edu/~easi/resource/kaitlinintro.html) which provides keyboard modifications, joystick controls, mouse emulators, voice recognition, magnification, braille translation screen readers and the like. Another source is Macintosh Disability Shareware (http://www.ecnet.net/users/gnorris /place.shtml). This site provides most of the same stuff as Kaitlin's place but for a MAC environment.

There are many sites that provide software which can be downloaded that can be used to teach both basic and advanced skills to children. The American Free Electronic Library (http://www.cris.com/%7EAfel/) provides a spelling tutor and basic math programs. The Altus Educational Software (http://www.bsoftware.com/seducate.htm) has programs for cloze procedures, flashcard makers, vocabulary builders, grammar programs' and worksheet generators. The Shareware Library (http://www.mesagroup.com/cdrom/shware.htm) sells cd-rom's at cost ($8.00) for children 2-8 years which contain games, vocabulary training, spelling, geography, math, colors, opposites, shapes, animated math, telling time and the abc's. Games Domain has a pair of sites with shareware for MACs and DOS based machines (http://www.gamesdomain.com/tigger/swnprogram/html). This site with the windows extension has Logo, Logic, How to Write a Homepage, and Kids Multimedia. Its companion site (/sw-mac.html) has programs for numbers, abc's, reading and math among other subjects. The DOS based companion site (sw-pcl.html) has programs for the alphabet, letters and numbers, art, mathematics, animals and reading.

A major Australian site has programs for students at all levels (http://www.gu.ed.au/aers/edsw/d-slang.htm) This site extension called Senior Language has programs for English and grammar, phonic spelling, a grammar analyzer, spelling, reading, vocabulary roots, word power, and word puzzles. A companion site called Junior Math (extension d-jmath.htm) has programs for basic multiplication, basic math, drills for adding, subtracting, multiplication and division, arcade style math games, math castle, counting and animated math. Another companion site (d-jmisc.htm) has programs for music, doll dressing, paper dolls and coloring books. The Junior Language Companion Site (d-jlang.htm) has an electronic storybook, letter lotto, alphabet games, spelling and balloon spelling, animated words, say-read-spell, phonics spelling, abc's, and an animated alphabet. There are a number of other site extensions for this site. Check them all out.

Sites for Parents - There are a number of rich sites for parents who have children with disabilities. Some of these sites are for specific disabilities and others are generic parent sites which have some materials for those who have children with disabilities. For those who are new to disabilities or who have not searched the literature,

NICHCY (National Information Center for Children and Youth) (http://www.kidsource.com/NICHCY /infantpub.html) is a fine source. The pages of NICHCY at a variety of levels include definitions of disabilities, parents views on disabilities, treatment procedures for a variety of disabilities, and a parent's guide to accessing programs for infants, toddlers, and preschoolers with disabilities. This latter guide has sections on early intervention, special education programs, rural services, IDEA, and a parents' record keeping worksheet to document interactions with the schools. Brad's Parenting Issues page (http://www.plantagenet.com/msteach. page2.htm#special) is another good source with many links to general sources as well as IEP issues for parents.

The home page of the Parents Journal of School Related Issues (http://www.parentsjournal.org/toc.html) provides online advise, access to articles, resources and a shopping mall of activities for parents. Marguerite Kelly's The Family Almanac (http://family.starwave.com/kelly/archive/kellyarc.html) provides access on line to a large series of articles written by Kelly dealing with development, socialization, schools, learning and so forth. These articles are short, readable, and parent friendly. Other Starwave sources include 365 outdoor activities (/funstuff /outdoor/index/html) and 365 TV free activities (/funstuff/activity/TVtoc.html). Other sources provide information on how to read along for parents (http://www.ed.gov/pubs/parents/reading/readalong.html), ways to find books, books for babies, and ways to develop family reading time. Also there are guides for parents on how to help children with their homework (http://www.kidsource.com/kidsource/content/homework.html) which includes how to help, how to monitor homework, how to provide guidance, how to talk to the school, and checklists for homework completion.

A major parent source for parents provides educational resources at http://www.execpc.com/~dboals/ parents.html. This homepage provides information and discussion groups on parents in crisis, children in divorce, a family resource center, a guide to reading children's books, a number of parenting magazines and a child support homepage. The site lists a variety of parenting resources, information on parenting teens, and a parenting checklist. There are links to publications for parents, a national parent network, a National Center for Fathering link, and a page on preparing for parenthood. Other links are to empowerment, a foster parent homepage, a high school student's survival guide, and a parents guide to supervising children's use of the internet. Additionally, there are links to information about teen sexuality, a teen parent's page, a family internet page, and a list of notable children's books that can be accessed through the internet. Finally, there is Our Daughter's Home Page which deals with the problems of young women growing up in modern society.

General/Multipurpose Sites - Multipurpose sites usually are link sites which do not in themselves contain the resources that you are looking for but have links to more specific sites. When you begin looking for educational information and you are not doing a general search, multipurpose sites are convenient. We should note here that we report only the unique sites and that multipurpose sites share many common links that we only report once. Let us start with Web Ed K-12 links (http://explorer.scrtec.org/explorer/aux/wEdlist.html). This massive site contains the following information: a users guide to educational programming on PBS, a link to the Math/Science Clearinghouse, a link to African-Americans in Science, a page for Odyssey of the Mind which is a creativity contest for students through the college level, a middle school kids website, a link to Volcano World where you can see volcano development, access to The Interactive Frog (a virtual frog which can be dissected without the smell of formaldehyde), a page on collaborative visualization, the Kidopedia (an encyclopedia created by children), and much, much more. This site also contains an educators guide to the internet which provides navigational tips to finding your way around to more good educational sites of special interest.

Another large site, Web Ed Wisconsin (http://badger.state.wi.us/agencies/dpi/www/webed.html) is provided by the Wisconsin Department of Public Instruction. This site provides web guides, kidsite links, teacher materials in science, math, and history, parent links, references and multicultural information and links. The Busy Teacher web site (http://www.ceismc.gatech.edu.busyt/) provides many resources and lesson plans for biology, chemistry, ecology, geology, mathematics, paleontology, physics, social studies, and recess, check out this last one! A similar site is the Teachers Helping Teachers site (http://www.pacificnet.net/~mandel/). This site provides a topic of the week designed to get you to come back on a weekly basis, a set of special education links, the arts, social studies, science, mathematics, language arts and classroom management.

The online Educational Resources site (http://www.ed.gov/EDRES/edcurric.html) provides the following links and access: the American Historical Collections from the digital library, an excellent source of old visuals for

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those who are creating historical curricula, the Internet Public Library which links libraries that have internet accessible collections which can be used for reference or research purposes, the Clearinghouse for Educational Resources which has many teacher accessible resources for the class or for individualization, access to a virtual exploritorium, and materials for environmental education training.

A site dealing with education and interesting places (http://ppkolumbus.fi/%7eemavan//ssm/sites.htm) has a general interest collection containing a Cyber School Magazine focusing on student learning in cyberspace, access to the Bank Street College home page, research links for student research and an antivirus center which can provide the latest virus filters and virus detection programs. There are pages on this site for language arts including online dictionaries, mathematics, science, arts, books on the internet where you can find whole books that can be read on screen or downloaded, and the visible human project which contains the micro shaved cross sections of a human body.

The Live and Learn Center (http://www.bcpl.lid.md.us/~hhirsch/learn.html) provides access to a wide variety of information, freeware and shareware, products which can be purchased, and to parent and teacher links. For those interested in landform and earth satellite images should visit The Learning Web (http://usgs.gov /education/) which, among other things, provides access to the U.S. Geological Survey data and other teacher oriented information. For books on line visit http:www.the group.net/bookt/tl.htm or for children's stories visit http://www.weber.edu/library/315sp/main.html. The Library of Congress online (http://lcweb.loc.gov/global/search .html) provides a search page of their holdings. The Classroom Connection (http://www.classroom.net/) has many resources, enrichment activities, and access to other teachers through chat room sites. For those who are interested in freeware and computerized children's games the, Tudogs site (http://dockside.co.za/egben/tudogs/) will be of interest. The Media Library Online Project site (http://interact.uoregon.edu/medialit/homepage) is a large site which provides children's radio and audio presentations, children's websites, teaching resources, and a job search page.

For those who want it all in one place, the Big List of Everything (http://www.algonet.se/%7eharlov /kick/hotkopia.htm) provides eighty five pages of links to almost everything you could imagine. Of special interest for teachers are headings for sections of the list (not links) including arts, plants and animals, parents and parenting, science, kids catalogue, literature and poetry, history, education journals online, a mapmaker, and online magazines.

A somewhat more specialized site is the NASA Regional Teacher Resource Center (http://www.teacherlink . usu.edu/nasa/index.html) which provides access to all NASA sites and to other space related sites. Another is the Math Lessons Data Base (http://mstemac4.ed.uiuc.edu/mathed/queryform.html) which provides links to internet based math lessons and a search engine which can search its index of lessons, a valuable resource.

A Canadian public school maintains a large site called the Assiniboine South School Curriculum Related Links site (http://www.mbnet.mb.ca/~mstimson/text/links.html). This site has links to science pages, mathematics lessons, social studies, art, music, computer instruction and lessons and other assorted sites.

For those with interest in technology you may wish to look at the Technology and Learning Ultimate Hotlist (http://www.techlearning.com:80/www/tnlcat/@024448sjgqwf/hotlinks.html). This site provides technological resources in the form of lesson plans, curriculum resource centers, K-12 curricula, sources for online projects, libraries, and museums.

For those who want lesson plans, Lesson Plans K-12 HTML is the place to go (http://www.execpc.com/~ dboals/appli.html). Here you may find world mythology, model cities, the Arts Ed Net, The Idea Factory, and the Idea Web Creativity Explorer. You will also find information about mentoring programs, cardboard cognition, Debate Web, peace corp lessons, 21st century problem solving processes for teaching peacemaking, ways to study science fiction, Math Central, lesson plan gophers (directories of compilations of lesson plans), lesson plan web sites using Bloom's taxonomy, and hundreds of other links.

Finally, a site focused on diversity for the classroom (http://www.execpc.com/~dboals/diversity.html) which includes material about critical thinking about diversity, indigenous peoples' literature, The Log Cabin Chronicles, suburban gangs, American identities, multicultural discussion, literary resources, hospice, nonviolence resources, and the Race Diversity Gopher.

Content Specific Sites: Literature and Language Arts - There are a number of huge sites on the net related to literature and language arts. A site that seems to have about everything is the Children's Literature Web Page (http:www.ucalgary.ca/~dkbrown/index/html). This site has hundreds of online stories including myths, classics, contemporary, and collections of stories, best sellers, online book reviews and resources for storytellers, writers, illustrators, teachers and parents. More specific sites of interest for small children include children's stories online (http://www.magickeys.com/book/index.html), Eldrbarry's Raven Tales (http:www.seanet.com/~eldrbarry /rabb/run.htm) which has Eldrbarry's stories about the raven, specific Indian stories, and Native American stories about youth and legends. This site also has links to native American art and museums. Nikolai's web site (http://www.nikolai.com/stories/story.htm) has reading comprehension activities, tall tales, short stories and a program where children can create their own stories. Wacky Web Tales (http://www.hmco.com/hmco/school/ tales/index.html) provides stories written by children for children. Billy Bear's Playground (http://www.cass.net/ %7erainiew/welcom.html) provides online storybooks, animated story books, games, and a program for creating your own personalized stories. Tales of Wonder is another interesting site (http://www.eca.ucdavis.edu/~ darsie/tales.html). This site provides tales from the middle east, Russia, Siberia, central Asia, China, Scandinavia, Africa, India, England, Scotland, Japan, and tales of Native Americans. A site for picture reading literacy (http://www.sped.ukans.edu/~pix_lit/) should be useful for teaching story lines and comprehension to nonreaders. It provides picture story sequences with task analyses, word lists, materials lists and special instructions. In the same vein there is a guide to children's literature and disabilities which has stories about disabled children which can be used to introduce disabilities to the abled (http://www.kidsource.com/nichcy/literature,html).

A language arts site (http//WWW.csun.edu/~vceed009/languagearts.html) provides lesson plan literature and links to online libraries, references and tools such as a biographical dictionary and a online spell checker, organizations interested in language arts, ideas and activities including alphabet activities and initial reading skills, and publishers. Another source of children's books is the Bookwire Electronic Children's book index (http://www .bookwire.com/links/readingroom/echildbooks.html). This site has electronic texts that can be read online or downloaded. Most are classics which are beyond copyright but texts by the following are exemplary: L.M Alcott, H.C. Anderson, L. Carroll, J. Conrad, R.L. Stevenson, M. Twain, J. London, R. Kipling, C. Dickens, D. Defoe. Also, this site has links to many other book indices at other locations. A site called Story Resources on the Web (http://www.cc.swarthmore.edu/~sjohnson/stories/) provides familiar tales, interactive stories and hyperfiction, story collections, methods of story telling, stories by children, children's stories, audio stories, tales from other countries, and lists of story tellers and story telling books and a national directory of story tellers.

Finally we would suggest the you visit the Student Page (http://www.execpc.com/~dboals/kids.html). This page has a great number of links including writing tutorials, children's electronic texts, a link to books on African-American heros, an interactive program which allows you to create your own character from Dr. Suess, a Goosebumps page, many magazines for children and teens, the Book Nook by Kids, Cyberhaunts for Kids, and games. Also, there is a collection of story resources including The Book Pile, fairy tales, a weekly story tellers circle, fishing stories, Tales of the World, picture books, the Ghost Zone, Candlelight Stories, the Banyan Tree Friends, the String Fairy, the Reading Room, kids stories, and Aesop's fables.

Content Specific Sites: Mathematics Resources - There are many sites which provide information on lesson plans and programs for mathematics. We have a few to share with you and we have tried again to list the links on these sites that are unique. Also, they have many overlapping links which we have not listed. Let us start with a site called The Wonderful World of Math. This site (http://plainfield.bypass.com/~union/world/html) has links to NCTM standards, Math Connections, Mathland, Lesson Plans On Line, math from the Wisconsin Department of Public Instruction (a great site), Explore Math outline, and Do It -internet lessons in mathematics. The K-12 Teachers Place (http://forum.swartmore.edu/teachers/k12.teachers.html) provides software for mathematics at a variety of levels, a chat room for talking math and teaching, classroom materials, and a variety of internet math projects.

There is a site for Title One mathematics resources (http://homepage.interaccess.com/~ky/math.html). This unique site contains a page for Ask Dr. Math, Escher patterns, a problem solving page, math proficiency tests, lesson plans, and a weather unit. A similar site contains Busy Teacher math materials (http://www.ccismc.gatech .edu/busyt/math.html). This site has materials for logic, parent involvement, lesson plans, teacher tips and ideas, and the puzzle of the month. The XAH Great Math Programs (http://www.best.com/~xah/page2_dr/MathPrograms

.html) provides links to mostly programs for Macintosh, an algebra page, 2 and 3 dimensional geometry, games, puzzles like tangrams, and polytile.

There is a general math page (http://www.csun.edu/~vceed009/math.html) which has applications, puzzles and problems, a home page for new math teachers, ideas and activities, lesson plans, ways to motivate underachievers, and a teacher talk forum.

Big List for High School Teachers Index (http://www.uni.uiuc.edu/uniweb/unifxg/outreach/jan13big list.html#math) provides links to the math archives, NCSA mathematics for educators, the WWW Virtual Library-math and the e-math home page. The Math Teacher Resource Index (http://www.coe.missouri.edu/~cibarnes/mathres.html) has information about math grants, a discussion group, Newton's Apple lesson plans, many math resource pages, math software and freeware, and a math hotlist link.

At Zia Math Education (http://www.zia.com/emath.htm) you can find family math, fun math, FAQ's for mathematics, math history, and rural math. The mathematics site (http://www.ncrel.org/sdrs/areas/maOcont.htm) provides math links to math education at UIC, a math archives gopher, and the math section of the Mathematics Diffusion Program. Materials recommended by the National Research Center (http://www.ncrel.org/sdrs/areas /maOtop10.htm) include counting for k-1, sorting grades 2-3, measuring grades 3-4, statistics grades 5-6 predicting and sampling grades 5-6, and means and medians grades 5-6. Finally, the site called Internet Based Math Materials (http://www.ncrd.org/sdrs/areas/issues/content/cntareas/math/ma200.htm) provides many examples of math problems and solutions, lesson plans and activities, kids web, math information servers, math resources from UW Madison, math magic challenges, and internet accessible materials.

Content Specific Sites: Science Materials - There are some sites which specialize only in science. However, remember that there are a large number of general sites that have some science information on them. One major science speciality site is called Science Education Resources (http://www.cedarnet.org/schools/science.html). This site contains links to elemental science, science exploration, the Franklin Institute Science Museum, a link called DNA to Dinosaurs, oceanography, the heart, paleontology, insects, and science lesson plans. A site called General Science Education Resources (http://www.hpcc.astro.washingtonon.edu/scied/gensci.html) provides sites about the ocean planet, helping children learn science, a bad science site, interactive multimedia science, a physical science activities manual, and the UCSD Lesson Plan Gopher. Internet Resources for Science Education is the label for another good site (http://www.educ.drake.edu/gerlovich/web_sites.html) which has links to the NASA home page, Kids as Global Scientists, Newton's apple, Kids Web, the Virtual Frog, the Village School House, Interactive Computers for Kids, a Science Archie, and the Science News home page. Finally, the Teaching Science Site (http://www.csun.edu/~vceed009/ideas.html) has ideas and activities, a Kids Did This science hotlist, Cockroach World, a homework help page, lesson plans and activities for earthday, biology, and a set of searchable databases.

Content Specific Sites: Social Studies Resources - The first site is the Student Page for Social Studies (http://www.execpc.com/~dboals/kids.html). This site provides links to Maya Quest, Thurgood Marshall's homepage, the Hands On Children's Museum, the Future Net Kid's page, a Girl's World, Smokey the Bear's page, career information, Street Smart on the Web, and story resources. The Busy Teacher page (http://www.ceismc .gatech.edu/busyt/soc.html) has links to lesson plans, activities, and teaching tips, civics, current affairs, and Get Fiscal. It also connects to a variety of references including the Legislative Congressional Library, the Federal Web Locator, and the CIA Fact Book.

Another social studies site (http://www.csun.edu/~vceed009/socialstudies.html) list organizations accessible on the web, lesson plans, searchable lesson plan databases, multimedia programs such as Oregon Trail, strategies for teaching history, Ancient Worlds, geography including a color landform atlas of the US, museums and other resources. Social studies sources (http://www.halcyon.com/howlevinsocial.studies.html#profess) provides interesting sites related to peace and conflict, cultural diversity, government and politics ,U.S. and world history, and news.

A social studies site dealing with online curriculum and lesson plans (http://artsedge.kennedy_center.org /irc/soc-quik.html) provides lesson plans for K-2 including the flag, map, city, native American, and a celebration timeline. Lesson plans for grades 3-5 include building bridges, community, a multicultural calendar, Where Do

You Live?, and Building a City. Additional curricula includes a George Washington multimedia program, totems, and Native American oral histories.

The last and largest site includes plans, activities, and teaching strategies for social studies (http://www.csun.edu/~vceed009/socialstudies.html) including African American lesson plans, Ask Asia, civics education lesson plans, lesson plans for teaching about China, Japan, news multimedia, core knowledge, critical thinking, labor history, economics, geography, and media. Also included are links to the UN, the Civil War Gazette, Teen Court, the Edstock Stock Market (where you can practice playing the market), Judges In Class, K-3 internet projects, a mapmaker, central America, and the holocaust. There are also links to teaching strategies such as creating web documents, teacher talk chat room, and a page on links. There are links to a Bag O'Tricks for social studies, a Spice Island Voyage, Time Detectives, using the History Channel, and a teacher talk forum.

Software/Freeware for Teachers - There are many software and freeware sites on the net. Generally when we present something as software rather than freeware there will be some sort of charge for it. The charge may be nothing more than a packaging charge when you get a cd-rom disk loaded with shareware, or it may be big dollars. Freeware, on the other hand, is free and can be downloaded to your computer. Some will say that you get what you pay for, but many of the programs are quite usable although the documentation may be sparse. Simtel.net provides many programs for education at several sites. Http://www.cdrom.com/simtel.net/win3/edu.htm lists Windows programs such as the Constitution Notebook, quotations, intermediate English, a civil war battles game, and an engine repair game. Non-windows programming is available including a visual computer dictionary, a reading skill exerciser, Show and Spell, Sounds Like a ..., punctuation fundamentals, numbers and counting, animated bugs, state capitol games, animated money, Concentration, animated word spell games, arcade like games for math, spelling and typing, sentence capitalization, telling time, connect the dots, and a Boggle clone.

There is a very large Australian site that has a great deal of freeware for a variety of levels of students. This site (http://www.gu.edu.au/aeres/edsw/) has a number of different extensions which add to the basis URL and access different levels in the directory. For example the extension "d-astronomy.htm" provides programs about skymaps, UFOs's, a planetarium, various planet and the moons of Jupiter, deep space, and pictures of astronomical events. History and geography are found at the extension "d-hisgeo.htm" which provides programs about naming the capitols of the world, state history and quizzes (these may be Australian states), world maps, historical timelines, and a world atlas. The extension "d-ssci.htm" provides programs from senior science. This extension includes programs about cell structure, DC circuits, electricity, one cylinder engines, practicing with chemical formulas, volts, resistance and current, plant growth, electrical circuit simulation, earth science tutorials, temperature conversions, and a game which teachers chemical valences. The miscellaneous extension "d-smisc.htm" has Jeopardy for Groups, trivia games, cultural literacy, an atlas, environment, logic and deduction, writing a resume, and puzzles. The senior math extension "d-smath.htm" includes a differential equation solver, metric conversions, drill programs, tutor programs, flash card makers, problem solving, multiplication, and math games. The low vision extension "d-lowvis.htm" has computer books for the blind, a brailler, a speech synthesizer, a large character text processor, a large character calculator, a checkbook manager, and a braille and speak program.

Sites for Special Education Teachers - The most comprehensive site for special education is SERI (http://www.hood.edu/seri/serihome.htm). SERI stands for Special Education Resources on the Internet an is a mega-compilation of links which will take you to samples of all of the special education resources on the net. SERI has links to organizations including national organizations and universities. It provides links to general special education resources, products, legal issues and advice, discussion groups, specific kinds of handicapping conditions such as mental retardation, physical and health disorders, learning disabilities, attention deficit disorder, speech impediments, gifted and talented, autism, visual impairment behavior disorders and hearing impairment. In addition, the site has links to pages on technology, inclusion, transition, psychology, medicine and health, and parents of special needs children.

There is a National Center to Improve Practice in Special Education Through Technology, Media and Materials (http://www.edc.org/FSN/NCIP/) which provides information about early childhood classrooms, and has a library of materials and programs for language skills, technology and organizing tools. The Office of Special Education at the Curry School (http://curry.edschool.virginia.edu/go/specialed/) provides information on special education, internet resources, and parenting information with many links to all of these topic areas.

There is a Teachers Helping Teachers page (http://www.pacificnet.net/~mandel/specialeducation.html) which provides a project book for the physically handicapped including art and book projects. It also has information related to the sense organs, ADHD behavioral management, and methods for dealing with behavior problems. A page of internet resources for special educators (http://www.interactive.net/~wader/sped.htm) provides links to resources related to teaching resources, rehabilitation, IEP programs, early childhood special education, disability categories including PKU and hyperlexia, links to clearinghouses, assistive technology, ADA, and web sites for students. Another special education resources site (http://wshs.luminet.net/sped/sped.html) has links to school to work, the Federal Resource Center for Special Education, a special education law page, CEC, tutoring and teaching academic skills, special education at the University of Kansas and at the University of Virginia, IEP resources, collaborative planning time and how to get it, and a reference shelf of special education materials.

There are a number of national resources pages like the National Clearinghouse of Rehabilitation Training Materials (http://www.nchrtm.okstate.edu/indextxt.htm). This site has materials related to rehabilitation of all forms, medical resources, disability resources, and web resources. There is a page for local perspectives on consolidation of special education funding (http://lists. ait_dc.org/csef-hom/policy5.html), and another page for the Federal Resource Center for Special Education (http://www.aed.org/special.ed/frc.html) which has an online newsletter, lists of OSERS and OSEP projects, and links to other special education web sites.

There are a number of other pages on the net that have interesting links and resources. For example Pitsco's special education page (http://www.pitsco.com/pitsco/specialed,html) has links to special education listservs, links to other web sites, information about diabetes, links to many typical special education topics, a link to the Council on Teacher Education and single switch software for disabled children. For those needing information about specific disabilities there are internet sites with summaries of papers (e.g., journal like articles) and other information (http://www.schdist42.bc.ca/projectinfo/sped3.html) e.g., practical applications. This site provides special education information for special education teachers, papers on at-risk students, software reviews focusing on special needs usage, learning disabilities, autism, and IBM special needs solutions. For those working in transition there is a business guide for hiring people with disabilities (http://janweb.icdi.wvu.edu/pcepd/docs /reading/meet.htm). Finally, there is a site (http://www.mewhope.org/tryon.htm) for inservice training where people can "try on a disability" through examples of reading reversals, sight impairment, speech impediments, and mobility problems.

General Disabilities Sites - Some sites deal with a variety of disabilities and resources at each individual site. As we have done in the past, we will try to point out the things that are unique about the sites, but remember that each site probably has many links and forms of information and resources that we do not discuss for space reasons. We hope you explore them further.

A site called Internet Resources for Special Education (http://w3.one.net/~julio_c/) is a typical general disabilites site. It provides general links and links for autism, seizure disorders, Rett's syndrome, rare diseases, spinal muscular atrophy, hydrocephalus, cleft-affected children, child amputee, brain injured, Asberger's syndrome, and ADHD. The Special Needs Education Network (http://www.schoolnet.ca/sne/) provides information about and links to muscular dystrophy, learning disabilities, developmental disabilities, CP, autism, multiple sclerosis, gifted and talented, FAS, Down's syndrome, deaf, visual impairment, dyslexia, ADD and other links.

The NCSA Mosaic access page (http://bucky.aa.uic.edu/index.html) provides access by individual disability, e.g., cognitive, hearing, physical, and vision and access to search resources such as http, gopher listserv, ftp, and Mosaic. Medweb Disabilities (http://www.ccemory.edu/whscl/medweb.disabled.html) provides, among many links, links to gentle teaching and Guillian-Barre syndrome. NICHCY, the National Information Clearinghouse for Children and Youth, (http://www.kidsource.com/nichcy) provides information about a daughter with disabilities, and answers many questions about special children and special services.

The ARC provides many sources of information, papers, and answers to questions. At this site (http://the arc.org/pubs/emplopubs.html) you can find employment publications. Farther up the tree there are many other resources. People with disabilities can interact with others at (http://sasquach.com/resources/easi.html). Here one can find out about the conditions in regular special education, talk to polio survivors, use a job accommodation

network, discuss chronic fatigue, visit a the virtual hospital, and a link to the social security act handbook.

A listing of various special education sites on the internet yield these links (http:/www.albany.net/~cacad/dsp/dislink.html): quadraplegics, Disabled Freedom, wheelchair user's page, the Disability Rights Activist, and the Service Dog page. The Disability Link Barn (http://www.spectra.net/~accessun/links.html) provides, in addition to regular special education links, access to vehicle modification information, augmentative communication, journals, sexuality, travel, and various sites listed by disability. The World Information Disability site (http://www.dacs.ES .tohoko.acjp/foreign/~wan_res.html) provides information about technology, strategies for the disabled, music therapy, disability travel, and an internet braille wizard. This site is similar to the International Disabilities Web (http://www.dpi.org/accestxt.html).

More information can be found at the Disability Directory (http://www.womensnet.org/pwd/) which has information about women with disabilities, developmental disabilities, psychiatric disabilities, independent living, and regular special education links. Disability Resources on the Internet (http://disability.com/cool.html) provides information about careers and employment, software, medical, mental disabilities, physical disabilities, prothesis, recreation, rehabilitation, and sensory disabilities. Disability Sites on the WWW (http://www.prostar.com/%7E thearc/dislink.htm) has links dealing with feeding gastronomy, Rubinstein-Taybi syndrome, tuberous sclerosis, PKU, axis disability, and many regular special education links. Those interested in adaptive technology can find a large list at http://interwork.sdsu.edu/ablenet.cre.html. A mental health information site (http://onlinepsych. com/mh/) provides information about ADHD, various disabilities from a psychological perspective, eating disorders, obsessive/compulsive disorders, and post traumatic stress disorder.

Mental Retardation: Down's Syndrome - These sites relate primarily to mental retardation. Most, but not all, have a focus in Down's syndrome. The American Association of Mental Retardation home page (http://www.aamr.org/disres.htm) provides information about the organization and links to rehabilitation information, the National Association for Down's syndrome, the Chariot magazine, The Association for Severely Handicapped (TASH) and other links. The Mental Retardation Web site (http://www.idir.net/~adabbs/mrsites.html) provides links to the Job Accommodation Network, national information, Our Kids, Parents Helping Parents, and Special Olympics, which can also be found directly (http://www.specialolympics.org/).

There are a number of small sites that may be of interest. For example, there are sites for issues related to retarded individuals going to court (http://thearc.org/ada/court.html) and their access to justice and fair treatment under criminal law (http:thearc.org/posits/justice,html). Mental retardation and HIV information can also be found (http://thearc.org/faqs/hiv.html.) Information about the neurobiology of mental retardation can also be located (http://www.ukans.edu/mrrc/mrrcth3.htm). A link to supportive employment material is available (http://205. 177.10/naric/rehab_b/rb-16-2.html). Information concerning dealing with siblings of the retarded can also be located (http://www.nas.com/downsyn/siblings.html). The ARC provides a variety of papers, fact sheets, and answers to FAQs (http://the arc.org/welcome.html) at a variety of extensions to their basic URL. Some of these fact sheets include dealing with mental illness and mental retardation, parenting, children with mental retardation, screening the newborn for retardation, and retardation among members of minority groups.

The Cliniweb site for mental retardation (http://www.ohsu.edu/cliniweb/cio/cio.496.html) provides a great deal of information about relatively rare syndromes. Topics include Cri-Duchat syndrome, homocystinuria, Laurena-Moon-Biedl syndrome, Williams syndrome, Lesch-Nyham syndrome, oculocerebrorenal syndrome, Angelman syndrome, Prader-Willi syndrome, and others.

Resources for Learning Disabilities - There are a number of sites specifically for the learning disabled. These include the Curry School's Office of Special Education page (http://curry.edschool.vi.edu/e/ose/categories /ld.html) which provides information on computers and learning disabilities, dyslexia, general resources, related organizations, definitions, and a variety of articles related to learning disabilities. Nerdworld Media (http://www .nerdworld.com/cgi-bin/udata.cgi/990) provides links to grant opportunities, language based difficulties, dyslexia, and prescriptive learning. NICHCY provides fact sheets on learning disabilities (http://www.kidsource.com/nichcy/). A general learning disabilities site page (http://indie.ca/eg/95.htm) provides information on ACT disability resources, neurological disabilities, ADD, dyslexia, and the Learning Disability Association America. Finally, there is a site (http://www-ld.ucsf.edu/pubs.html) which provides language based

interactive training games related to phoneme identification, circus sequencing, and phonic matching.

Resources for Attention Deficit Hyperactivity Disorder - The best of a few sources is the ADHD Owner's Manual (http://ourworld.compuserv.com/homepages/edutech/). This site provides information on how it feels to have ADHD, who gets it, associated learning disabilities, behavioral and other treatment intervention methods, effective medication, neurology, and tips for teachers. Some sites that provide a variety of ADHD articles and fact sheets are http://www.kidsource.com/nichcy/addl.html, http://www.yahoo/com/health, and http://family.starwave.com. Another site (http://www.chadd.org/50class.htm) provides fifty tips on classroom management of ADD problems.

Resources for the Visually Impaired - There are a number of internet sites which provide information about visual impairment and blindness. Some of these sites provide resources and others provide links. We will start with a generic site (http://www.igc.apc.org/pwd/) which provides access to several organization such as the American Foundation for the Blind, the American Council for the Blind, the American Federation of the Blind, and the National Federation for the Blind. The Seaside links for vision disabilities (http://www.seaside.org/linx.html) connects to braille services, low vision land, windows tips for use with low vision, and interactive braille guide, a manual on how to guide the blind, and the Danish Electronic Library for the Blind.

The Blindness Resource Center site (http://www.nyise.org/orgs.htm) provides links to the American Printing House for the Blind, the Clearinghouse for Information Technology, Recording for the Blind, the National Center to Improve Practice, a page about leader dogs, and a ski school for the blind. The Telesensory Blindness Resource Center (http://www.nyise.org/blind.htm) provides information about resource sites, braille, translators, advocacy, deaf-blind, eye disease, organizations and universities, vendors for technology, and homepages for the blind community. The RNIB Challenge for Blindness (http://www.rnib.org.uk/linksite/vis.mp.htm) shares information about national organizations (Britain), how to use the internet NCSA, recording, resources, deaf-blind web resources, Students' Rag home page, and an interactive braille guide.

Other more specialized sites provide technological solutions to problems (http://www.austin.ibm.com/sns /snssmag.html) e.g., for screen readers and screen magnifiers. There is information about working with the blind and visually impaired to develop job accommodation (http://janweb.icdi.wvu.edu/kinder/502blind), braille books for children (http://www.22cent.com/seedlings/indexg.html), parent education resources (http://www.igc.apc.org/afb /parent.html), and the National Library Service for the Blind (http://lcweb.loc.gov/nls/nls.html). These are a few of the thousands of sites for rural special educators on the internet. Good hunting.

HTML and Websites

Writing HTML Documents: Resources for Learning - Some will want to create their own html documents and their own or school websites. We will now explore how to find the material to do this. HTML (HyperText Markup Language) documents, advertisements, and other texts are the basis for web pages on the internet. In this section we will look at how to find out about document creation, some basic practices, and some of the components of a document which can be used to make a document which is accessible and attractive. Most of the documents viewed on the internet are html documents.

There are a great many sites on the net which try to provide information on how to write in html or on how to create a web site. We will first look at the sites which teach or describe the document and then we will look at sites which assist in creating web sites.

Beginner's Guide to HTML - A well used site that is linked to many pages is the Beginner's Guide to HTML (http://www.ncsa.eiuc.edu/general/internet/www/HTMLPrimerAll.html). The guide's Primer defines a basic html document by its components. Each of the components has a standard tag <tag name> which can be identified in any document. A document starts with a head, a title, and a body . The body can be composed of headings, a variety of subheadings (a maximum of six nested levels), paragraphs or text under the headings, lists of information, and preformatted text which is imported from elsewhere. Other tags such as line breaks, horizontal rules, and addresses are explained and exemplified. The Primer provides an example of a minimal document and provides access to links which will allow validation of html code using an html validation service.

The Primer describes the linking process which shows how specific URLs lead to specific levels within a document. It describes pathnames and the difference between absolute and relative URLs. It provides a basic outline of the use of names and shows how they can be imported. Issues such as image size and how that affects the use, image aligning processes, processes for alternating text and images, development of background graphics and colors, and the use of animation and external images are discussed. There is a section on character formatting, the use of logical and physical styles and the development of escape sequences. A section on troubleshooting includes dealing with overlapping logic and overlapping embedding.

The Primer identifies several html editors and describes processes for getting on a server. A section on tables and table tags and how they are used to create a general table is presented. The Primer has links to pages on good html composition, a style guide for online hypertext, another introduction to html, the Yale center for Advanced Instructional Media, an html Quick reference guide, and a page on how to write in html. It also provides links to official html specifications, SGML, creating tables on the web, development of JAVA script, forms and essential scripts explained, and a page on the development of background images. Finally, it shows how the VIEW SOURCE command enables one to see how all pages are put together and how to copy the ways in which html code is written to create specific effects.

A question and answer users group called Guides to Web Mastery (http:union.ncsa.uiuc.edu:80/Hypernews /get/www/html/guides.html) provides answers to questions related to the world wide web, servers, browsers, images (and how to use them), html converters, html editors, html language, and web style. The Guide also provides access to learning about html using tutorials, advanced tutorials, web postings for tutorials, and books on support webs for html. Usually, what you will find at these Q & A sites are pages where you can post questions that others will answer. Sometimes the answers will come quickly, but sometimes you will have to wait several days before someone takes pity on you and answers your question.

Other HTML Pages - Another popular page for learning html is Yahoo HTML. This page resides in the Yahoo Directory (http://www.yahoo.com/Computers_and_Internet/Software/Data_Formats/html/) and provides a great many links to sites like Publishing Multimedia on the Internet, validation checkers, HTML Obsession (100's of links here), constructing and registering URLs, creating tables for html documents, and creating animated home pages. Yahoo HTML has a link to searches for a picture page generator which allows you to create web pages with jpeg and gif image components. There is a site with a complete list of tags; other sites provide ways to create events, extensions, forms, guides and tutorials. Other sites provide answers to frequently asked questions, various html languages (2.0, 3.0, etc.), converters, and a Java script guide for those who are more advanced. There are links to html+, html editors, and mailing lists for html workgroups. Also, there are links to sgml and client-side image map directions.

There is a Sandia site (http://www.sandia.gov/sci_compute/html_ref.html) which is called the Reference Manual which provides syntax, comments, elements, URLs, special characters, and directions on internal icons. Another site (http:/www.cs.cmu.edu/~tilt/cgh/) provides directions on how to write html. Specifically of interest here are the sections on common errors and things to avoid when creating your web page. The Library of Congress (http://lcweb.loc.gov/global/html.html) provides many links to sites related to the development and use of html. The is also a general homepage for html information on the world wide web (http://www.w3.org/hypertext/www/ markup/markup.html).

A final large site is called Tips for Writers and Designers of Web Pages (http:www/dseigel.com/tips /index.html). This site provides information about typography including when to use bold type (only on working works in a sentence), dark backgrounds (when you show pictures), italics (for quotes, definitions and new personal words), capital letters (when you want a word to shout), and how to present information in more effective ways other than bullets or numbered lists on web pages. A number of recommendations are provided for using images, e.g., using single pixel gif's to make spaces except in tables. Other tips include ways of setting up resource folders to hold images you are working with so that you have ready access to them while you are creating your page and information on vertical spacing, i.e., using different amounts of white space for different level headings. It is recommended that you do not center floating subheads nor use horizontal rules as separators. In horizontal spacing it is recommended that you use 10-12 words per line for maximum readability. You should not try to justify your spacing as the web cancels justification spaces. Therefore transparent gifs are recommended for spacing. You

should also remember not to set your margins larger than 640 X 480 pixels or most machines will not be able to read them without wrapping the lines around. You do not want your readers to have to use a scroll bar to read your lines.

There is a discussion of the use of tiled backgrounds which look pretty but take a long time to load. The important feature here is the signal to noise ratio. The text should stand out from the background and be easily readable. If the background interferes with the message it should not be used. There is a discussion of table borders and a recommendation that they be turned off because many think that they are ugly.

Lastly this site has a discussion about images and the use of the Netscape 256 color palette. Images should be small so that they will load easily. Netscape will read the 256 color palette and load it into Photoshop. The Adobe Photoshop is recommended by this page maker as the best for web graphics. The page author also discusses how to use Adobe's gif89a export filter to develop interlacing and transparent gif. The filter is available for free download.

Hagan Heller has an interesting page which provides a html help library (http://www.netscape.com/people /hagan/html/bg.html). She provides pages, not links, titles the basics, titles, links, samples of the basics, tables (all kinds of tables with the html language to create them), frames including scroll bars, named windows and targeted anchors, forms, and Perl (another language). She also provides a section on images including jpeg, height/width constraints, interlaced gif, two pass gif, transparent gif, and animated gif. This is a really good site for beginners.

Backgrounds - For more specific information you may want to explore the Yahoo backgrounds site (http://www.yahoo.com/Computers_and_Internet/Internet/World_Wide_Web/page_design_and_layout/graphics/backgrounds/). This site provides links to color information, frequently asked questions about backgrounds, 3D backgrounds, original designs that can be copied for free, an html picture archive where you can download pictures, a link to different textures you can use, links to precreated free backgrounds with samples, collections and a link with 390 free backgrounds. It also provides a graphics browser which can be used to look for backgrounds, free background and title bar designs for home pages, background tiles for Gif89a and bmp formats, and an index for backgrounds, clip art and textures.

Checkers/Validation Sites - Several sites (http://www.ugrad.cs.ubc.ca/spider/q7fl192/branch/checker.html and http://www.cs. dartmouth.edu/~crow/lvrfy.html , and http://wsk.eit.com/wsk/dist/doc/admin/webtest/ verify_links.html) check sites for deadlinks in your pages and for other errors in composition and syntax (http://www.hal.com/~markg/webtech s/validation_form.html , andhttp:uts.cc.utexas.edu/~church/htmlchck.html). Cybernet international provides Gif 89a based animation for Netscape 2.0 and higher (http://www.reiworld.com /royalef/gifan/.htm). This site provides information about specification, structure, construction of animations including sequencing, and troubleshooting. Pages at this site also discuss benefits and limitations of animation, provide links to the toolbox which provides instruction on gif for Macs and Windows environments. There is an animation tutorial which will help you make an animation sequence, an animated gif loop, and provides tricks of the trade. This site also provides a link to html assistance and troubleshooting.

Creating Websites and Homepages on the Internet

In this section we will show you some of the rules for website construction and lots of locations where you can get more information. Generally there are few differences between a homepage, which an individual designs for him/herself and a web page which an individual designs for some specific organization or purpose, such as providing information of interest to other people. However, there should be differences in the sites to describe a product, advertise a product or product, or provide interesting information to a broad audience who may not have the same interests or levels of expertise. We will try to illustrate some of these differences.

Sites for Beginners - Let us start by presenting sites which will help in developing the basic pieces of a web page, the html components. An example would be the site for Page Design and Layout (http://www.yahoo .com/Computers_ andInternet/Internet/World_Wide_Web/Page_Design_and_Layout/). This page presents validation checker links, information on transparent images, links which will help in animating gifs, including Gif World, development of backgrounds, color information, basic html, design tips including a section on page design,

tips and tools, and a series of hints which will help you create a better page. It also has links to a variety of icons and the Logo Factory which provides access to free icons. It links to sources of image map creation for presenting imagery and provides access to information on advanced photoshop techniques. It also provides a page on creating graphics for the web and the top 10 mistakes made in page design.

Resources for Homepage Design (http://www.ferris.edu/htmls/connect/worldwideweb/webstyle.htm) is a site which has many good links. It links to Composing Good html, and the John December's guide to successful website development. December provides six processes and the key elements for website design. There is a page on setting up a website for your school including instructions on getting connected, website design, management issues on who can put what on the website and the like. There are also links to exemplary K-12 websites and a template for a K-12 home page which will get you started if you need to get on the net in a hurry. There are also links to the Yale c/aim WWW Style Manual which provides information on web page and interface design and on ways to optimize page performance. There are links to web images, color palettes and other color information, the Web Developers Virtual Library, and Weblint which can be used to check for errors in html. Another html validation service is located at http://www.webtechs.com/html-val-svc/.

Another site, How to build a Website that Works (http://www.unplug.com/great/) provides information on page building, a template for a sample page, and links to online resources. It also goes through the six step process which its designers claim are necessary for designing a good webpage. The six steps or phases are developing content, outlining the organization of the page, specifying the navigation parameters, designing the interface, producing the webpage, and maintaining the site. Each of these steps is described in some detail.

Intellectual Property - Before you start to use the work of others on your site, you should visit the library resources list (http:badger.state.wi.us/agencies/dpi/www/lib_nii.htm). This site provides information on intellectual property rights, cyberpages, discussions from the Union for the Public Domain, information on infrastructure sites, censorship, and information about library use from web pages, and much, much more.

Advanced Page Design - There is a large site with many helpful hints on home page design (http:// millkern.com/dodon't.html). The authors suggest that you should be kind to end users, provide concise and interesting text, be helpful, clear, and engaging in your prose development. You should explain all links so that users know where you are sending them and what they will get there, there should be no surprises. You should use anchors to improve navigation. You should offer a text only option for those with machines that do not handle graphics well and list file size and format so that low end users can avoid files that are too large for them. You should not use big graphics, have mystery links, toot your own horn, or make the assumption that everyone has a t-3 line and can, therefore, quickly download anything you throw at them.

Several recommendations on producing your own home page are given. You should have several different users try it out, hopefully using different browsers so that you can learn if there is anything that needs to be fixed so that others can use your material effectively. You don't want your page to develop a reputation for being hard to use, or people will not come to visit you. You will also want to access it through a modem to see how it downloads timewise.

How should your site be navigated? Always describe your links and annotate them so that users can understand them. If you use logic for navigation, how do you know that the user knows the logic? You should be careful with buttons, icons, and the like as all browsers will not universally recognize them. You also have to think about how you design the interface. It should be simple, predictable, and should have limited graphics because of loading times. You should check the loading time from a remote location. Remember, what you can do on your LAN may not be possible from a distance. You should also flowchart the organization of your page, your site, and your links to insure that you know not only what you are linking to but also how users are likely to traverse your page to get to the links. You would usually want users to see at least some of your material before they leave you.

You need to consider and plan what your content will be. You should try to specify who your audience will be, what they need, and what is the real purpose of your site. Brainstorming is an excellent way to start. Remember that you may have a diverse audience who are not homogenous, have different needs, and will take different pathways through the information that you provide on your webpage. Your audience may be at different

age and experience levels; school age kids, parents, and employers in the community may all access the page. They should find appropriate pages and links through your menu. This analysis applies to your links, too. Kids linking to your page will expect and be interested in links that are very different from those desired by older members of the community.

Finally, this page talks about site maintenance. You should date your information as a matter of course so that others can determine is currency and relevance. You should check your links periodically to insure that all of them lead to sites that are still working. Remember, you must link to other sites so that the search engines can find you. Dead links are of no use to your consumers or to you in attracting others to your page. Finally, if you have a large site, put in a What's New page. Here you can list the additions to your site and when you put them up. This will help users find new information when you create it for them. Some site designers go so far as to set up a listserv to notify those who are interested when new information is added to the site.

Advanced/Yale Site - The Yale Web Site Manual (http://info.med.yale.edu/caim/ StyleManual_top.html) contains many pieces of information for both the novice and the advanced webpage developer. The manual starts by describing the components of the basic web page which include the banner graphic no larger than 472 pixels (usually with an interlaced gif), sub title and section titles if they are included, contents, a logo graphic, the author's name and affiliation, the authors email address, and the date of the last revision so that users can tell how old the information is that you have put on the net. At the rate things are changing on the web, much of the information that is over a year old is out of date and should not be relied upon.

In addition, you should include your institutional logo, if any, links to local sites, the URL, and a variety of navigational aids such as buttons and scroll bars which will allow users to move forward and backward among your pages. You should always include bidirectional links so that no page is a dead end particularly when it may be accessed directly from the outside. There is a discussion of the use of footers which can be used to include author identification and identification of the origin of the page. The footer can also include ways to contact the author, copyright status of the material, and the last revision date. There are sections on graphics which specify appropriate sizes in height and width according to the Joint Photographics Experts Group (jpeg). Also provided is a description of the menu structure you should use if your page has a number of subpages. Menus, they argue, should be hierarchical and neither too shallow (too few levels) or too deep (too many levels). Templates are provided for pages, pages with graphics, simple lists, and lists of linked items. The appropriate html code is provided for copying for each of these templates.

The Yale designers argue that if you are building a multiple page array you must start with a carefully organized design grid. This is similar to an instructional design template for instructional development. Using the grid will insure that every page is linked to other pages appropriately (at least a link to your home page). In designing a grid it is recommended that you establish how type blocks and illustrations will be organized so that your pages all will be recognizable as members of a set. It is suggested that you be consistent in designing navigational aids. If you are not consistant, your pages will be patchy looking and users may not know when they have left your set of pages and have been linked to someone else's page by a seamless link.

When building pages you should generally divide pages into new accessible pages every 2-3 print pages making them easier to update. However, if you have long text documents of which users may want copies, you should have a separate file that can be downloaded which will contain all of the text. Pages should contain no more than 2-3 screens, 680-480 pixels of information. Also, each page should begin and end with a navigation link.

Advanced/Stanford Site - There is a large website at Stanford University (http://cast.stanford.edu/cast /www/boston/style.html#intro) which provides information about style and form. Elements of style are broken down into rules of usage and principles of composition. Basic rule of usage for website design include: make sure your links work, limit your page content except when the document is designed to be downloaded whole, and consider your white-space balance. Try to maintain stylistic coherence with your graphics. If you do not, users will not know when you have linked them to another page or when they are on your page. Try to avoid dead-end links, ones where you cannot get back to other pages in the document. These can be very frustrating to users who link to these pages. They cannot find out the other things that your page may have to offer. This can be avoided by having buttons for TOP, NEXT and PREVIOUS on all pages. You should try to make your titles descriptive so that those

who are searching will know what you have to offer. Remember that some searches will only look at titles and you will be missed if your title is not clear in describing what you have to offer. In the same vein, you should put the most important information at the top of your page. Some search engines only index the first 100 characters of the page and this is what they will search when someone queries their index. Another tip is to place links on the word that describes where the link goes rather than cluttering up the page by saying press here for more information. That kind of a link designator is considered immature and is not considered a sign of sophisticated page development. Finally you should avoid generic web information which is available on many pages. This kind of information clutters up your page and does nothing to induce others to return again to visit your page.

The Standford site provides information on approaches to style, some of which we have listed before but which may bear repeating. Consider the relationship of breadth to depth in your directories (for large sites). No one should have to move through several levels, one page at a time, to find information of interest. To preclude this, you should map your documents so that you can see what the alternate pathways may be and provide links so that no pathway requires too many intervening pages. To help in this process and to facilitate revision later, you should number the links within each paragraph. Numbering will be helpful if links die or if new links need to be inserted. You should also provide some information to the user as to what level of the directory they are in. This will facilitate their exploration of the information which you want to share with them. You should facilitate movement between pages or levels either by functionality or by organization and at at some point on the page try to explicate this to your users. Finally, you should have some content of your own on your homepage or linked directly from your page.

A section on composition looks at audience, purpose, and the like which is similar to what we have looked at before. You may want to visit it to get an alternative perspective. Lastly, there is a section on matters of form which provides rules of good etiquette for page design. Some of the unique contributions of this section include the idea that graphics, icons and designs should have meaning which contribute to your page. They should not be included just to show off what you think are neat visuals. If you use graphics developed by others, you should always get permission to use them. It is considered poor form to steal others' graphics without permission and without giving attribution. You should provide webmaster information on your pages so that others can contact you, particularly if you have links which are not under your control and may die. Finally, you should use ALT TAGS for video (some may not be able to receive video), text only page versions (for those who have slow machines or who are visually handicapped), images, and the text of audio files which are necessary for those who are auditorially challenged.

Page Evaluation - A contemporary page by a young author, we presume, is entitled Ten Ways to Tell if You have a Sucky Homepage (http://www.glover.com/sucky.html). The author lists a number of things that you should not do. These include the use of unreadable text, blinking headers, saying that your page is under construction (all pages are subject to revision and therefore are under construction), images that are too large (they take too long to download), and too much background (if it is too complex you may not be able to read or print information easily). The author asserts that good pages should be easy to download with a limited number of graphics. You should not include graphics unless users are likely to be interested in them (don't include your cat's picture unless you have a page on cats). Images should be unique and show what you want them to show. Don't scan in a picture of yourself taken at a distance, unless you are really ugly. Crop your pictures so that they show what you want them to show. It is recommended that you use gif for line art compression and jpeg for photo compression to get the best results.

Validation Reasons - One site explains why you should always validate your html. This site (http://www.earth.com/bod-style/why~validate.html) provides a set of arguments as to why you should validate your page html every time you make a change and provides links to places that allow you to do it. The argument follows. New browsers may use the newest language and they may reject your page. If this happens you will not be linked to the new hot browsers and you will not get the exposure that you want for your page. The web is all about reusable content. Search engines revisit pages continually. If they won't read your page, you lose. This site also provides an html bad style page which gives examples of what not to do and why the practices are bad from a construction standpoint.

Registration and Your Web Page - John December's page (http://www.december.com/web/develop

/processes.html) provides much of the same information as other pages on web construction. Some of its unique features include information about page promotion including advertising and a variety of different services which will help you in registering your URL with different search services for maximum site exposure on the web. He provides a section on testing and evaluation of commercial sites using focus groups which could be easily adapted to use by the public schools and which should be considered by all of those who will try to draw multiple characteristic audiences to the same web site. December also presents a list of considerations including the idea that the web is dynamic and changing.

The web is interactive, you need to be sure that others can interact with you. They cannot if they cannot find you. Therefore, you need to register your web page with all the search engines. The web is unbound by space and time. Your users will come from all over the world and a any time of the day or night. Having a server that shuts down during the night means that those several time zones away may never find you at home. It is the same for weekends. If the server is down on weekends only those who can surf during the workday will have access. Who do you exclude by this practice? Remember that you are competing for the attention of the user. You are bound together with other sites in a use context which is defined by the way a search engine organizes your data. The associations are composed of many links in many locations. The web is porus and may be entered at many levels based on these associations. Be sure that your users can find where they are and what they need from any location in your directory.

Freeware/Page Design - Besides the large design pages there are some smaller pages which have information which may be of interest. For example, another style guide provides an alternative look at many of the issues we have already discussed (http://www.w3.org/pub/www/provide/style/aic.html). They also provide a discussion on what is acceptable content for web pages. Obviously pornography will not be welcome on or linked to your page, but what are the other categories? Read their discussion for insights. A Free Stuff design page (http://www.unplug.com/great /free/free.htm) provides information on free internet access, free websites (usually templates into which you can feed your unique information), browser software for both Netscape and Microsoft, graphics software, e.g., Paintshop Pro, and free background patterns. Other sites provide tools and tutorials related to using images (http://tns-www.lcs.mit.edu/cgi-bin/mapmaker), free clip art (http://www.clipart.com), and instructions for setting up a counter to see how many people visit your page (http://www.best.com/~kroberts/acc_kntr.html).

Quality Website Recommendations - The last site we will share with you is Quality Websites (http://coombs.anu.edu.au/standards/ guidelines.html). This site has many recommendations for quality websites including organization. This site recommends that you should be network friendly with few moving images, no decorative only graphics, no superseded or redundant files, the site should be easy to navigate, the directory should not contain too many levels of nesting, no dead links and no empty subdirectories. You should provide local links, local materials, and identify local versus distant materials. A good site is easy to find. It is in many directories and on many resource lists. It should have lots of high quality links and be easy to access through several points and through several servers. A good sites serves both high and low technology users. The server should be up 24 hours a day, seven days a week. Make sure your site is tracked by several good search engines and your platform does not overload easily. Test it to see if it can handle several users at one time. If it cannot, it will never become a truly good site because people will not stand in line for it unless you give away free money.

WEB SEARCH ENGINES

ENGINE	BOOLEAN LOGIC	PHRASE	FIELD(S) SEARCHED	SPECIAL FEATURES	TRUNCATE	COMMENTS
Alta Vista http://www.altavista.digital.com/	AND, OR, AND NOT, NEAR all must be capitalized	Double quotes or ; between words	Anchor, applet, host, image, link, text, title, URL	Weighted keyword search, capitals recognized	* at end of key word or in the middle for spelling variant	Fast, comprehensive, may have difficulty limiting searches, good for web pages, no ftp or gopher
Excite http://www.excite.com/	AND, OR, AND NOT must be capitalized	Parentheses or double quotes	Full text searches by subject in net directory	Natural language searching, capitals recognized, current news, Usenet, detailed summaries	No, use multiple forms of the word with OR connectors	Difficult to narrow searches, finds ideas related to topic
Hotbot http://www.hotbot.com/	Limited; select from "all the words", "any of the words" for and an or. Select must contain or must not contain for in or exclusion	Double quotes or select "search the phrase" on the pull down button	Location, date, media type (image, applet, audio ,extensions such as jpeg), full text	Modify search one step at a time. Capitalization for people names	No	Fast and powerful
Infoseek Ultra http://www.akweb.com/singles/ultra.html	Limited. +must include, -must exclude. Boolean planned later	double quotes, or ADJ=adjacent	Title, URL, link, site	Search backwards. Capitals recognized. Auto name recognition. Ignores inflection.	Auto find of word variants	Best for searching beyond the web
Lycos http:/www.lycos.com//	AND, OR, +must, -must not	No	Titles, headings, links, keywords, picture, sound, text first twenty lines or 50 words. Short URL's preferred	No capitalization recognition	Automatic for word endings, or $ for manual control. Period (.) after word for exact match	Old but still useful

WEB SEARCH ENGINES (Continued)

ENGINE	BOOLEAN LOGIC	PHRASE	FIELD(S) SEARCHED	SPECIAL FEATURES	TRUNCATE	COMMENTS
Opentext http://index.opentext.net/	AND, OR, NOT	NEAR/FOLLOWED BY	URL's, title, summary, heading, link, full text	No capitalization recognition. Weighted search allows keyword weighing. Find similar. Choose depth or breadth search	Auto only	Powerful, easy to use. Good search refinement.